Periodic slow slip and interplate earthquakes in Tohoku subduction zone

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Small repeating earthquakes are earthquakes that repeatedly occur at a same location. They are thought to repeat by stress accumulation on a locked patch due to a fault creep (slow slip) in the surrounding area. Taking advantage of the occurrence mechanism, we estimate the temporal change of fault creep from the activity of repeating earthquakes. The result show that quasi-periodic slow slip occurs in a wide area along the plate boundary off Tohoku. The slip accelerates at periods ranging from 1 to 6 years and often correlates with the occurrence of $M \geq 5$ earthquakes. Moreover, the clustering of $M \geq 5$ earthquakes with a ~3-year period in off Sanriku has persisted since 1930 (81 years). These results suggest that the megathrust zone exhibits an inherently periodic slow-slip behavior that results in periodic stress perturbations and modulates the occurrence time of larger earthquakes.